Total relative damage caused by a product system

$$= \sum_i D_i / D_c = \sum_i \frac{CI_i}{N_i} \frac{N_i}{T_i} f_i \quad (15)$$

From equation (15) and (8), the total relative damage caused by a product system is the same as the total weighted impact caused by a product system. In other words, weighted impact is synonymous to relative damage.

The purpose of introducing the concept of critical damage and relative damage in Figs. 1 to 3 is to support the logic for the selection of weighting factors and the weighting procedure in the weighting method proposed in this paper. Of particular interest is to show the relationship between normalized impact and relative damage. After all, the damage caused by an impact is of concern. A graphical presentation helps us to visualize damage caused by an impact. Since it is impractical to predict absolute damage, a relative damage is of use in quantifying the impact caused by a product system.

4 Conclusion

A weighting factor proposed for the Korean Eco-Indicator is a product of a reduction factor (N_i/T_i) in the distance-to-target method and a relative significance factor (f_i) based on the precautionary principle. Politically determined critical impact (T/f_i) is assumed to cause a critical damage that is defined as a level of damage acceptable to the realization of a sustainable society. A graphical relationship between relative damage and normalized impact indicates that weighting factor ((N_i/T_i) f_i) is the slope of this graph. An eco-indicator of a product system is the total weighted impact or total relative damage of that product system.

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LCA Certification in Italy

LCA Certification According to ISO 14.040: First Experience

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Introduction

This paper presents a project which is a first experience of LCA certification according to ISO Standard 14.040.
After its publication in June 1997, the ISO Standard 14.040 received a great deal of attention from many companies interested in an LCA application to their processes: the possibility of obtaining a certificate to demonstrate the accuracy of this application, in fact, is now more attractive than in the past.
Since ISO 14.040 has a very flexible structure, it is possible to adapt the standard to the process under investigation and to address any suggested improvements using a well planned and standardised framework.
The procedure described here can certainly be improved in order to reach particular goals, but it clearly constitutes a starting point to make LCA studies more reliable and transparent. Indeed, it is an accurate application of LCA framework requirements with the new possibility of a non-interested party guarantee. In particular, the certification authority guarantees the effort of the company towards a continuous improvement of environmental performances of the analysed product system. In fact, while it was sufficient to entrust the study to a well known LCA practitioner in the past, it is now more convenient to certify the completeness and reliability of the study by a fourth party, i.e. the external reviewer.

The investigated process

The LCA study was held at ABB Kent Taylor S.p.A. and was performed by ABB Corporate Research Italy, in co-operation with process engineers. The certification procedure, described later in this paper, took about four months, while the entire analysis lasted approximately one year.

A report of this study was recently presented at the 6th SETAC LCA Case Studies Symposium [1], but it is possible to introduce the work as follows: the analysis was performed on a pressure transmitter that is the main and innovative product of the above mentioned ABB factory; the choice of this particular product was made according to the environmental management policy which targets selected strategic products for LCA studies in order to plan suitable actions that contribute to environmental protection issues.

The certification procedures

The procedures necessary to obtain the certification were studied and applied by RINA (Registro Italiano Navale) [2], a certification body accredited by SINCERT (Italian Certification System), an organisation set up to recognise certification bodies in Italy on the basis of the parameters foreseen in the international standard EN 45012. RINA is also part of the CISQ (Italian Certification of company Quality Systems) Federation, a multi-sectorial and independent organisation which brings together the certification bodies representative of the main categories interested in certification at a national level. The CISQ adheres to the international agreement IGNet (International Certification Network) for the mutual recognition and promotion of the Quality System Certificates issued by its members within the European Union and EFTA (European Free-Trade Association) and by numerous other non-EEC countries such as Canada, Japan, Australia and Singapore.
Since the beginning of the project an interdisciplinary working group was formed at RINA to follow the project and a group of experts is now implementing these procedures to meet new client requirements.
In general, the RINA certifying program concerns the life-cycle study of a well specified product system and the conformity of the improvement actions made on the product system itself to the life-cycle study results. This is an important concept for the development of the LCA methodology: first an LCA study is checked, verified and certified according to the ISO standard, then, before product certification is released, the conformity of the product to the results of the study is checked (together with the use of a licensed logo). The improvement suggestions obtained from the study results should be applied in order to maintain the certification and a new LCA of the improved product system has to be performed with new suggestions, etc.
According to the LCA methodology and philosophy, the possibility to use LCA as a model to test changes and to build simulations makes any improvement procedure fast and easily verifiable.

How to obtain the certification of an LCA study

Companies which are interested in obtaining the ISO 14.040 certification in Italy are invited to present a well defined documentation to RINA: production site characteristics and an accurate description of the product system for which the certification is asked are the main requirements.
Of course, RINA doesn't provide any consultancy to its clients: a Life Cycle Assessment of the product system, critical reviews of the study (both internal and external) and a comparative table which clarifies the link between the ISO standards requirements and papers presented are required as supporting documents to the application form. In any case, a co-operation between working groups is planned only to discuss in time any strategic decision for a quick development of the analysis.
When RINA receives all the above-mentioned documents, a formal acceptance of the "iter" is sent to the Company and the controlling procedure starts.

Starting (initial) verification

All documents received by RINA are analysed according to ISO 14.040 requirements. Every time that a non-conformity appears, the company has to solve the problem before the "iter" goes on. Following this phase, a plan of visits to the production site is drawn up.

Visits to the plant: audit

The main goal of on site audits is to verify the accordance between the documents presented and the production process for which the certification is required. In particular, the following elements are of prime importance:

- system boundaries;
- considered unit processes;
- methods used for data collection;
- energy and materials input/output;
- allocation procedures;
- transport operations.

Great emphasis is given to the transparency of the report and to the reproducibility of calculation procedures adopted by the study authors. Moreover, it is important to verify the correctness of all data or of every statement; a link with a quality system is obviously an advantage.

Release and maintenance of the Certificate

At the end of all verifications and audits, RINA will release a certification on the LCA study of its conformity to the ISO 14.040 standard. Now it is possible to consider the certified LCA study as a reference point and to plan any improving action as a comparative analysis. For instance, if a recycling scenario of the product at the end of its useful life is now planned, the possibility to check any environmental consequence can beperformed by checking the existing end of a life option with the new version, and a certifying authority can be asked to verify and certify the change to the product system. If no evidence of any improvement to the product system is given, the certification expires.

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